REMARKS/ARGUMENTS

Claims 1, 3 – 7, and 9 – 25 are in the application. Reconsideration is respectfully requested.

Amendment to the Specification

The foregoing amendments to the specification have been made to correct obvious typographical errors. Entry of these amendments is respectfully requested.

Claim Objections

Claims 1 and 12 have been revised to follow the Examiner's helpful suggestions. Accordingly, applicant believes that the objections made in paragraph 1 of the Detailed Action may now be withdrawn.

Claim Rejection under Section 112

Claim 20 has been amended to relate to method claim 7, and thereby further limit that method claim. Thus, the rejection made in paragraphs 2 and 3 of the Detailed Action may now be withdrawn.

Claim Rejection under Section 102

All of the originally filed claims 1 – 20 were rejected as anticipated by Buican, US Patent No. 4,905,169. In reply, applicant submits the following remarks.

The present invention generally relates to the development of information that shows from direct diagnostic evidence, in real time, whether and how well a photoelastic modulator (PEM) is operating. In this regard, the acoustic wave amplitude and velocity of a vibrating PEM depend upon on the optical element's temperature. Consequently, the resonant frequency of the PEM will also depend on the device's temperature. The resonant frequency of the PEM relates directly to the operating frequency of the PEM and, therefore, to the retardance characteristics (such as the retardation amplitude) that are imparted into light that is directed through the PEM. This potential for drift in the operational frequency of a PEM and the attendant, undesirable change in the PEM's retardation amplitude is explained in the specification on page 2.

The real-time information indicating the actual performance of the PEM (that is, the particulars of the retardance characteristics induced by the PEM into the light that passes through it) is provided by the claimed diagnostic system. A primary advantage of this system is that one

can obtain independent confirmation that the PEM is properly functioning in an optical sense. In many applications, the PEM is installed as a small component in a much larger system, sometimes an enclosed system that is difficult and expensive to deconstruct for diagnostic purposes, such as in a cleanroom or vacuum environment. The operator cannot assume that the electronic feedback from the PEM controller indicates that the optical element is actually oscillating at the appropriate frequency and amplitude. In many cases, therefore, the only way to confirm that the PEM is functioning properly is to use a remote diagnostic system as claimed here.

Buican includes the use of a photoelastic modulator in the interferometer system described there for simultaneously measuring the spectral wavelengths of the scattered and fluorescent light of a flow cytometer. Buican does not contemplate the use of an integrated diagnostic system that includes a separate diagnostic light beam directed through the PEM and using the information from that beam to determine the actual performance of the PEM.

Claims 1, and 3 - 5

Claim 1 has been amended to include the subject matter of canceled claim 2 and more clearly point out that the diagnostic light is directed through the optical element at a location remote from the primary aperture through which the primary beam is directed.

In rejecting original claims 1 and 2, the Examiner read Fig. 6 of Buican as showing a diagnostic light beam (said to be the beam reflected to the PEM 22 by mirror 40) that is remote from the aperture through which the primary beam (said to be the beam reflected to the PEM 22 by polarizer 36).

In reply, applicant submits that the two beams that are shown in Buican as passing through the schematically diagrammed PEM 22 cannot be fairly characterized as one beam passing through the PEM at a location remote from the location (aperture) that the other beam passes through the PEM. This is evident from Fig. 5, and the related discussion (column 7, lines 17 – 19) which specifies that the "*second light wave 39 enters birefringent element 22 at substantially the same location as the point of entry thereinto of first light wave 37.*"[1] Moreover, the Buican reference includes at least two claims (claim 2, lines 31 – 34, and claim 18, lines 22 – 25) that specify that the beams of concern that are reflected to the birefringence element enter "*at the same location.*"

On the other hand, there is nothing in Buican describing an aperture in the PEM 22 through which one beam passes. Nor is there anything in Buican suggesting (contrary to Buican's "same location" language noted above) that the two beams should enter the PEM at different (one remote from the other) locations. Accordingly, applicant submits the Buican reference, when read as a whole, does not anticipate what is defined in amended claim 1. Accordingly, that claim, and the claims depending therefrom, are believed to be in condition for allowance.

Claim 6

Claim 6 has been amended to clarify that the system of claim 1 uses the retardance characteristics of the diagnostic light to calculate a retardance characteristic of the distinct, primary light (hence, the real-time operating performance of the PEM). The particulars of this are described in the specification, beginning on page 7, last paragraph.

Nothing in Buican teaches or suggests using the retardance characteristics of one beam to calculate the retardance characteristic of another, distinct beam. Buican does not contemplate a diagnostic technique as claimed. The reference beams 66, 68 briefly referred to in Buican (column 8, lines 24 – 28) are used to align elements of the apparatus (presumably, for example, the polarizer 36 and mirror to ensure the beams reflected by those elements pass through the same location in the PEM 22) or for wavelength calibration. There is no suggestion in Buican of using retardance characteristic of one beam to determine the retardance characteristic of the other beam. Accordingly, amended claim 6 is believed to be allowable over the art of record.

Claims 7 and 9

Method claim 7 has been amended to include the subject matter of cancelled claim 8, and includes the step of generating a diagnostic signal and converting that diagnostic signal to a (verification) signal that represents the retardance characteristic of a primary light beam that is directed through the optical element of a PEM.

Only beams 37 and 39 pass through a PEM in Buican. There is no mention or suggestion in Buican of the steps of generating a diagnostic signal based on one beam and converting that signal to another signal that represents the retardance characteristic of the other beam.

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[1] Light waves 37 and 39 match those identified by the Examiner in rejecting claims 1 and 2 (first paragraph, page 4 of the Detailed Action).

Accordingly, claims 7 and 9 and the claims depending therefrom are believed to be in condition for allowance.

Claim 10

This claim has been amended to specify that the primary and diagnostic beams do not cross each other, which is contrary to what is shown in the angled-beam paths of Buican. Accordingly, Buican does not anticipate claim 10.

Claims 11 and 12

As described in the present application, the portion of the optical element (of the PEM) through which the diagnostic beam passes is offset from the portion of the optical element through which the primary beam passes. Consequently, the PEM affects (that is, imparts retardance characteristics) the diagnostic beam unlike the PEM affects the primary beam (claim 11). This offset is used (see page 8 of the specification) to determine a signal that represents the PEM's affect on the primary beam.

There is nothing in Buican suggesting that one beam through the PEM should be affected differently by the PEM as compared to the other beam. On the contrary, applicant submits that Buican's "same location" language mentioned above results in having both beams affected in the same way by the PEM. Accordingly, claims 11 and 12 are allowable.

Claim 13

This claim has been amended to specify that the step of housing the optical element to define two discrete (separate) apertures is such that one beam is transmitted through one aperture and the other beam is transmitted through the other aperture. While Buican may inherently disclose a housing with front and back openings to allow beams 37 and 39 to pass through the PEM, there is nothing in Buican to suggest separate apertures, one aperture for each beam, as is defined in amended claim 13. Accordingly, claim 13 is also believed to be in condition for allowance.

Claims 14 - 18

Claim 14 has been amended to specify that the primary and diagnostic light pass through the optical element of the PEM at locations that are spaced apart so that the PEM imparts different retardance characteristics in each beam. Thus, for the reasons set forth above with respect to claims 1 and 11, claim 14 and the claims depending therefrom are allowable.

Claims 19 and 20

Claims 19 and 20 point out that the wavelength of the diagnostic light is different from that of the primary beam. As noted on page 7, paragraph 3 of the specification, the wavelength of the diagnostic beam is selected to achieve optimum sensitivity to the modulation level of the corresponding detector 64 while avoiding interference with the operating frequency of the primary beam. There is nothing in Buican, including the portion of Buican identified in the Office action (column 8, lines 24 – 28), to suggest that the two reference beams mentioned in Buican should have separate wavelengths.

New Claims 21 - 25

New claims 21 – 25 are added to more particularly point out features of the present invention. For example, nothing in the art of record suggests the extrapolation carried out by the processing means of claim 21; the beam spacing of claims 22 and 23; the separate (in time) transmission of the primary and diagnostic beams of claim 24; or the use of the extrapolated signal of claim 21 for a feedback control as defined in claim 25. Accordingly, applicant believes these new claims are allowable.

Conclusion

In view of the foregoing, applicant believes that all of the currently pending claims are in condition for allowance, and an early notification to that effect is respectfully requested. If the Examiner has any questions, she is invited to contact applicant's attorney at the below-listed telephone number.

Respectfully submitted,
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